

## PATENT ABSTRACTS OF JAPAN

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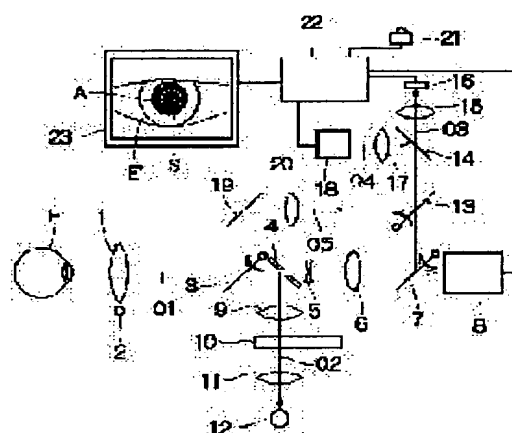
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## (54) FUNDUS CAMERA

## (57)Abstract:

PROBLEM TO BE SOLVED: To simplify the positioning at the time of photographing.

SOLUTION: When an anterior section is to be observed, optical path branching members 3, 13 are inserted in an optical path, a light source is lighted, and an alignment mark A around the optical axis showing the pupil diameter required for photographing is electrically generated and displayed on a television monitor 23. A focusing split image S is shown in the pupil of an anterior section image E', the split image S passes through a focusing lens 5 and an image forming lens 6, is reflected on a switching mirror 7, and is formed on an image pickup means 18. An operator matches the split image S for a focus adjustment while observing the image on the television monitor 23, matches the alignment mark A with the pupil, and adjusts the operating distance based on the focus of a pupil image.



## LEGAL STATUS

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 CLAIMS
 

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## [Claim(s)]

[Claim 1] A fundus camera which is equipped with the following and characterized by picturizing the focal flux of light and an anterior eye segment image which were projected on eyegrounds with said image pick-up means. An optical division member which divides an eyegrounds illumination-light way and an eyegrounds image image formation optical path which were arranged near the pupil conjugation location examined the eyes through an objective lens Optical system which carries out image of the anterior eye segment to eyegrounds through optical-path tee material prepared, respectively between this optical division member and said objective lens and between said optical division members and image pick-up means, respectively

[Claim 2] A fundus camera characterized by changing at least a photography eyegrounds display which has a memory means to memorize an eyegrounds image or eyegrounds drawing for alignment, a strange fixation lamp with a good location, and a display means to display said eyegrounds image or eyegrounds drawing, and is displayed on said display means according to a motion of said fixation lamp.

[Claim 3] A fundus camera characterized by picturizing an anterior eye segment and eyegrounds which are equipped with an optical division member, have image formation optical system which carries out image formation of eyegrounds and the anterior eye segment to an image pick-up means to have sensitivity in the light and infrared light, respectively, a source of infrared light which illuminates an anterior eye segment by infrared light, and a source of the light which illuminates eyegrounds by the light, and were illuminated by said source of infrared light, and said source of the light, respectively with said image pick-up means.

[Claim 4] A fundus camera characterized by having a display means to divide selectively into the single screen an image of the 1st image pick-up means which picturizes an anterior eye segment, the 2nd image pick-up means which picturizes eyegrounds, and said 1st image pick-up means, and an image of said 2nd image pick-up means, and to display them on it.

[Claim 5] A fundus camera characterized by displaying simultaneously an alignment mark generated electrically [ when displaying said anterior eye segment image ] in a fundus camera which has a display means to display an anterior eye segment image and an eyegrounds image selectively.

[Claim 6] A fundus camera characterized by having the 2nd optical-path tee material prepared between an optical division member which arranges in a pupil abbreviation conjugation location examined the eyes through an objective lens, and divides an eyegrounds illumination-light bunch and the ophthalmography flux of light, the 1st optical-path tee material prepared between this optical division member and said objective lens, and an image pick-up means to picturize said optical division member and eyegrounds, or an anterior eye segment.

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] This invention relates to the fundus camera used in order to picturize an eyegrounds image in an ophthalmological clinic.

[0002]

[Description of the Prior Art] Conventionally, while a \*\* person looks at an eyegrounds image in a fundus camera, a photograph is taken by carrying out alignment.

[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional example, there is a trouble that the actuation which takes a photograph by performing exact alignment is not necessarily easy.

[0004] The object of this invention cancels an above-mentioned trouble, and is for the alignment at the time of photography to offer an easy fundus camera.

[0005] Other objects of this invention are to offer the fundus camera which takes a photograph by carrying out alignment, looking at an anterior eye segment.

[0006] The object of further others of this invention is to offer the fundus camera which can pinpoint a photography part, even if it does not see eyegrounds examined the eyes.

[0007] The object of further others of this invention is to offer the fundus camera which carried out the image pick-up means at the time of observation and photography in common, and simplified the configuration.

[0008] Both the objects of further others of this invention are to offer the fundus camera which can do alignment easily, looking at an eyegrounds image and an anterior eye segment image.

[0009] The object of further others of this invention is to offer the fundus camera which can choose the alignment by the eyegrounds image, and the alignment by the anterior eye segment.

[0010]

[Means for Solving the Problem] A fundus camera concerning this invention for attaining the above-mentioned object An optical division member which divides an eyegrounds illumination-light way and an eyegrounds image image formation optical path which were arranged near the pupil conjugation location examined the eyes through an objective lens, It has optical system which carries out image formation of the anterior eye segment to eyegrounds through optical-path tee material prepared, respectively between this optical division member and said objective lens and between said optical division members and image pick-up means, respectively, and is characterized by picturizing the focal flux of light and an anterior eye segment image which were projected on eyegrounds with said image pick-up means.

[0011] Moreover, a fundus camera concerning this invention has a memory means to memorize an eyegrounds image or eyegrounds drawing for alignment, a strange fixation lamp with a good location, and a display means to display said eyegrounds image or eyegrounds drawing, and is characterized by changing at least a photography eyegrounds display displayed on said display means according to a motion of said fixation lamp.

[0012] A fundus camera concerning this invention is equipped with an optical division member, has image formation optical system which carries out image formation of eyegrounds and the anterior eye segment to an image pick-up means to have sensitivity in the light and infrared light, respectively, a source of infrared light which illuminates an anterior eye segment by infrared light, and a source of the light which illuminates eyegrounds by the light, and is characterized by to picturize an anterior eye segment and eyegrounds which were illuminated by said source of infrared light, and said source of the light, respectively with said image pick-up means.

[0013] A fundus camera concerning this invention is characterized by having a display means to divide selectively into the single screen an image of the 1st image pick-up means which picturizes an anterior eye segment, the 2nd image pick-up means which picturizes eyegrounds, and said 1st image pick-up means, and an image of said 2nd image pick-up means, and to display them on it.

[0014] In a fundus camera which has a display means to display an anterior eye segment image and an eyegrounds image selectively, a fundus camera concerning this invention is characterized by displaying simultaneously an alignment mark generated electrically, when displaying said anterior eye segment image.

[0015] A fundus camera concerning this invention is characterized by to have the 2nd optical-path tee material prepared between an optical division member which arranges in a pupil abbreviation conjugation location examined the eyes through an objective lens, and divides an eyegrounds illumination-light bunch and the ophthalmography flux of light, the 1st optical-path tee material prepared between this optical division member and said objective lens, and an image pick-up means picturize said optical division member and eyegrounds, or an anterior eye segment.

[0016]

[Embodiment of the Invention] This invention is explained to details based on the example of a graphic display. Drawing 1 shows the block diagram of the non-mydrasis fundus camera of the 1st example, and this fundus camera can take a photograph, looking at an eyegrounds image or an anterior eye segment. The optometry E-ed is countered, an objective lens 1 is arranged, and the infrared light light source 2 for anterior eye segment lighting is arranged near the objective lens 1. the optical-path tee material 3 movable on the optical path O1 of an objective lens 1 in back, and a hole — the vacancy mirror 4, the focal lens 5, the image-formation lens 6, the change mirror 7, and a color image pick-up means 8 have sensitivity only in the light arrange one by one —

picture signal of two image pick-up means 18 and 43 is once memorized with the signal-processing means 22, is calculated after that, and is displayed on a television monitor 23 as a partial composition screen which sets some screens by the image pick-up means 43 to small screen 23a.

[0029] The infrared LED light source 37 projects the spot flux of light on eyegrounds from one side of the pupil examined [ E ] the eyes through a lens 36, drawing 35, the optical division member 33, the optical-path tee material 3, and an objective lens 1. The original optical path is mostly reflected by the return half mirror 34, and the reflected light passes along drawing 38 and a lens 39, and results in the line array sensor 40. A refractivity is measured in that location, the focal lens 5 is driven by the driving means 31 based on this refractivity, and an eyegrounds image is focused. A focus generates the display P which shows a focus to a television monitor 23. Moreover, at the time of photography, the optical-path tee material 3 and the change mirror 7 are evacuated from an optical path O1, and the eyegrounds image R is photoed by the image pick-up means 8 by the stroboscope of the light source 12.

[0030] In the mode which looks at and photos anterior eye segment image E', anterior eye segment image E' of the large visual field of the image pick-up means 43 is reflected to the limit of the screen of a television monitor 23. The check of photographic coverage displays eyegrounds drawing r like drawing 2 memorized beforehand with anterior eye segment image E', and the image pick-up means 18 is not used. Since a visual field is larger than small screen 23a, alignment of the first outline is performed in this mode, and it may check and photo a photography part, looking at a change and the eyegrounds image R to both screen modes as shown in drawing 3 after that. In addition, when displaying the eyegrounds image R on a television monitor 23, the image pick-up means 43 is not used.

[0031] Drawing 4 shows the block diagram of the fundus camera which looks at and photos anterior eye segment image E' of the 3rd example. the change mirror 50 and an image pick-up means 51 to have sensitivity in the light and infrared light arrange behind the lens 6 on an optical path O1 — having — a hole — on the optical path O2 of the direction of incidence of the vacancy mirror 4 A lens 9, the split photography optical system 10 for focuses, a lens 11, the filter 52 that penetrates the light and intercepts infrared light, and the stroboscope light source 53 for photography are arranged. Moreover, on the optical path O5 of the reflective direction of the optical-path tee material 3, the mirror 19, the lens 54, and the mirror 55 were arranged, and it has resulted at the change mirror 50 on an optical path O1. Others are the same as that of the 1st example.

[0032] An anterior eye segment image carries out image formation of the anterior eye segment to the image pick-up means 51 through the lens 54 grade of an optical path O5. The image pick-up means 51 displays an anterior eye segment dynamic image on a television monitor 23 at the time of alignment, at the time of photography, the optical-path tee material 3 and the change mirror 50 are evacuated from an optical path O1, and the quiescence eyegrounds image which was illuminated by the stroboscope light source 53 and picturized by the image pick-up means 51 is displayed on a television monitor 23 instead of anterior eye segment image E'.

[0033] As shown in drawing 2, the eyegrounds drawing r memorized is displayed on the small image of a television monitor 23 with anterior eye segment image E'. It is reflected with the rear face of the change mirror 50, and the flux of light from a fixation lamp 16 is projected on the optometry E-ed, adjusts a fixation lamp location and Frame W with a trackball 21, changes the eyegrounds drawing r to an eyegrounds part in connection with it, and determines photographic coverage.

[0034] Moreover, the eyegrounds image for alignment can also be memorized and used instead of memorizing the eyegrounds drawing r.

[0035]

[Effect of the Invention] By dividing an optical path and picturizing the focal flux of light and an anterior eye segment image, the fundus camera applied to this invention as explained above carries out alignment easily with a simple configuration, and the ophthalmography of it becomes possible.

[0036] Moreover, since the fundus camera concerning this invention can display the eyegrounds image memorized by moving the frame mark which shows the photographic coverage displayed on the eyegrounds image or eyegrounds image of a display means in connection with the motion of a fixation lamp, even if it does not observe eyegrounds examined the eyes, it can perform the check of photographic coverage.

[0037] By picturizing an anterior eye segment and eyegrounds with an image pick-up means to have sensitivity in infrared light and the light, the fundus camera concerning this invention carries out alignment easily with a simple configuration, and the ophthalmography of it becomes possible.

[0038] By establishing an image pick-up means to picturize an anterior eye segment, and an image pick-up means to picturize eyegrounds, compounding the image of both the image pick-up means selectively, and displaying it, the fundus camera concerning this invention can do alignment easily, and the ophthalmography of it becomes possible.

[0039] Since the fundus camera concerning this invention can be displayed on a position by displaying the alignment mark generated electrically when displaying an anterior eye segment, the exact alignment of it becomes possible.

[0040] By preparing optical-path tee material before and after an optical division member [ \*\*\*\* / a pupil ], the fundus camera concerning this invention looks at an anterior eye segment with a simple configuration, and the ophthalmography of it becomes possible.

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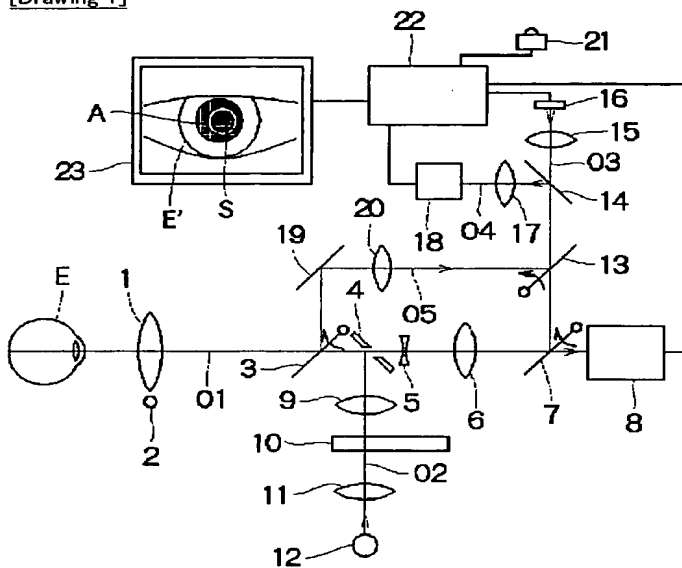
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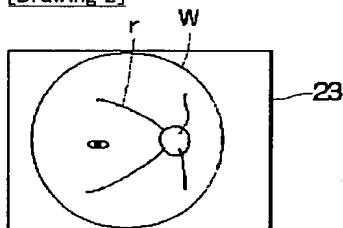
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## DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]